JC05 Rec'd PCT/PTO 17 JUL 2001

PCT

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FORM PTO-1390 (REV. 11-2000) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER: **4320-350**

U.S. APPLICATION NO. (If known, see 37 CFR 1.5): 09/889351

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/CA00/01354	**November 15, 2000**	**November 18, 1999**

TITLE OF INVENTION: **IMMERSED MEMBRANE FILTRATION SYSTEM AND OVERFLOW PROCESS**

APPLICANT(S) FOR DO/EO/US: **Steven Pedersen, Pierre Cote, Arnold Janson, Nicholas Adams, Jason Cadera**

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☑ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☑ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.
4. ☐ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☑ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. ☑ is attached hereto (required only if not communicated by the International Bureau).
   b. ☑ has been communicated by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
   a. ☐ is attached hereto.
   b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☐ Amendments to the claims of the International Aplication under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. ☐ are attached hereto (required only if not communicated by the International Bureau).
   b. ☐ have been communicated by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☐ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).
9. ☑ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ An English lanugage translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11 to 20 below concern document(s) or information included:

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☑ A FIRST preliminary amendment.
14. ☐ A SECOND or SUBSEQUENT preliminary amendment.
15. ☐ A substitute specification.
16. ☐ A change of power of attorney and/or address letter.
17. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
18. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
19. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
20. ☑ Other items or information: A copy of Form PCT/RO/101

JC18 Rec'd PCT/PTO 17 JUL 2001

BERESKIN & PARR

U.S. APPLICATION NO. (if known, see 37 CFR 1.5) 09/889351	INTERNATIONAL APPLICATION NO PCT/CA00/01354	ATTORNEY'S DOCKET NUMBER 4320-350

				CALCULATIONS	PTO USE ONLY
21. ☑ The following fees are submitted:					
BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)):					
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO **$1000.00**					
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO **$860.00**					
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO **$710.00**					
International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) **$690.00**					
International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) **$100.00**					
ENTER APPROPRIATE BASIC FEE AMOUNT =				$ 860.00	
Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				$	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	$	
Total claims	20 - 20 =	0	x **$18.00**	$	
Independent claims	2 - 3 =	0	x **$80.00**	$	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ **$270.00**	$ 0.00	
TOTAL OF ABOVE CALCULATIONS =				$ 860.00	
☐ Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.				$	
SUBTOTAL =				$ 860.00	
Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				$	
TOTAL NATIONAL FEE =				$ 860.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property +				$	
TOTAL FEES ENCLOSED =				$ 860.00	
				Amount to be refunded:	$
				charged:	$

a. ☑ A check in the amount of $ 860.00 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. ____________ in the amount of $ __________ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☑ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 022095. A duplicate copy of this sheet is enclosed.

d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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Scott Pundsack
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09/889351

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Barristers and Solicitors/Patent and Trade Mark Agents
Practice Restricted to Intellectual Property Law

Applicant : Jason Arnold et al.
Appl. No : PCT/CA00/01354
Filed : November 15, 2000
Title : IMMERSED MEMBRANE FILTRATION SYSTEM AND OVERFLOW PROCESS

Docket No. : 4320-350

Honorable Commissioner of Patents
Washington, D.C
20231

AMENDMENT

Sir:

Please amend the above-identified application as follows:

In the specification:

Please add a paragraph before the title of **FIELD OF THE INVENTION** on page 1, line 3, with the following text:

--This is a continuation-in-part of U.S. patent application serial no. 09/565,032, filed on May 5, 2000 and a continuation-in-part of U.S. patent application serial no. 09/505,718 filed on February 17, 2000. These applications are incorporated herein by this reference.--

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Appl. No. PCT/CA00/01354

VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the specification:

A new paragraph is added before the title of **FIELD OF THE INVENTION** on page 1, line 3, with the following text:

--This is a continuation-in-part of U.S. patent application serial no. 09/565,032, filed on May 5, 2000 and a continuation-in-part of U.S. patent application serial no. 09/505,718 filed on February 17, 2000. These applications are incorporated herein by this reference.--

Respectfully submitted,

Bereskin & Parr

By Scott Pundsack
Scott R. Pundsack,
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(416) 957-1698

Title: Immersed Membrane Filtration System and Overflow Process

FIELD OF THE INVENTION

This invention relates to a filtration system using immersed suction driven filtering membranes to filter water, for example, to filter surface water to produce potable water, and to a method of operating such a system.

BACKGROUND OF THE INVENTION

A prior art immersed membrane water filtration system is shown in Figure 1. An open tank (a) holds a membrane module (b) immersed in tank water (c). Feed water to be filtered flows into the tank, typically continuously. Suction on an inner surface of the membranes in the membrane module (b) draws filtered permeate through the membrane wall. Solids are rejected by the membranes and accumulate in the tank water (c). Solids rich retentate is continuously or periodically drained from the tank.

The membrane module (b) is cleaned in part by backwashing and aeration. In backwashing, a backwashing liquid (typically permeate or permeate with a chemical additive) is pumped into the inner spaces of the membranes and flows into the tank water (c). In aeration, air bubbles are created at an aerator (d) mounted below the membrane module (c). The air bubbles agitate and scour the membranes and create an air lift effect. The air lift effect moves tank water (c) in a recirculation pattern (e) upwards through the membrane module (b) and in a downcomer (f) through spaces between the perimeter of the module (b) and the sides of the tank (a). The tank water (c) flowing in the recirculation pattern (e) further physically cleans the membranes and disperses solids rich water from near the membrane module (b).

SUMMARY OF THE INVENTION

It is an object of the present invention to improve on the prior art. This object is met by the combination of features, steps or both found in the independant claims, the dependent claims disclosing further advantageous embodiments of the invention. The following summary may not describe all necessary features of the invention which may reside in a sub-combination of the following features or in a combination with features described in other parts of this document.

In various aspects of the invention, a filtration system having immersed suction driven filtering membranes is used to filter water containing low concentrations of suspended solids, for example, to filter surface water to produce potable water. A process is provided for operating such a system.

Membrane modules are arranged in a tank open to the atmosphere and fill most of its horizontal cross sectional area. An upper portion of the tank encloses a volume directly above the modules. This upper portion of the tank is provided with a retentate outlet from the tank. Tank water that is not withdrawn as permeate flows out of the tank through the retentate outlet.

Permeate is withdrawn by suction on an inner surface of the membranes, preferably at a flux between 10 and 60 $L/m^2/h$, more preferably between 20 and 40 $L/m^2/h$. Feed water is added to the tank at a rate that substantially equals the rate at which permeate is withdrawn. Thus during permeation little if any tank water flows out of the outlet and the level of the tank water remains above the membranes.

Permeation is stopped periodically for a deconcentration step. During the deconcentration step the membranes are backwashed, feed flow is

provided from below the modules or both. Tank water rises through the modules, the water level in the tank rises and tank water containing solids (then called retentate) flows out of the retentate outlet to deconcentrate the tank water. Aeration with scouring bubbles is provided during the deconcentration step.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic representation of a prior art filtration system.

Figure 2 is a schematic representation of a filtering reactor made in accordance with a preferred embodiment of the present invention.

Figure 3 is a plan view of a filtering reactor made in accordance with a preferred embodiment of the present invention.

DETAILED DESCRIPTION OF EMBODIMENTS

Referring to Figure 2, three membrane modules 10 are stacked on top of each other in a tank 12. The tank 12 is open to the atmosphere although it may be covered with a vented lid 13. The membrane modules 10 may contain flat sheet or hollow fibre membranes with pore sizes in the microfiltration or ultrafiltration range, preferably between 0.003 and 10 microns and more preferably between 0.01 and 1.0 microns. An inner surface of the membranes is connected to one or more headers. An aerator 14 is mounted below the membrane modules 10. The aerator 14 is connected to an air supply pipe 14 in turn connected to a supply of air, nitrogen or other suitable gas. The membrane modules 10 include, within their horizontal cross-sectional area, channels for water and air bubbles to flow vertically through the membrane modules 10 to agitate or scour the membranes. When membrane modules 10 are stacked on top of each other, they are aligned such that water can flow vertically through the stack.

Preferably, the membrane modules 10 contain hollow fibre membranes oriented horizontally and mounted in a slightly slackened state between pairs of horizontally spaced, vertically extending headers. One example is formed of several elements placed side-by-side, each element having a large number of fibres of between 0.2 and 1.0 mm outside diameter and between 0.2 m and 1.0 m in length (the shorter length used for the smaller diameter fibres and the longer length used for larger diameter fibres) potted at either end in a header but with permeate withdrawn from only one header. The elements may be separated by impervious vertical plates. Such modules can provide 500 to 1500 m^2 of membrane surface area for each m^2 of horizontal cross-sectional area of a large municipal or commercial tank and there is minimal channeling or dead zones when tank water flows through the modules.

The membrane modules 10 are sized and positioned to fill most of the horizontal cross-sectional area of the tank 12 leaving room only for necessary fittings and other apparatus and maintenance or set-up procedures. Space is not provided for downcomers outside the perimeter of the modules 10 and baffles are provided if necessary to block flow through any space left for fittings etc. or otherwise outside the perimeter of the membrane modules 10. Preferably more than 90%, more preferably substantially all, of the horizontal cross-sectional area of the tank 12 is filled with membrane modules 10.

A permeate pipe 18 connects the headers of the membrane modules 10 to means for permeating by suction on the inner surfaces of the membranes and backwashing means. Such means are known in the art and allow the permeate pipe 18 to be used to either withdraw permeate from the tank 12 or to flow a backwashing liquid (typically permeate or permeate mixed with a chemical) in a reverse direction through the membranes and into the tank 12 in which the backwashing liquid becomes part of tank water 36.

An upper portion 20 of the tank 12 is provided with a retentate outlet 22 having an overflow area 24 connected to a drain pipe 26 to remove retentate from the tank 12. Retentate outlet 22 preferably incorporates an overflow or weir 28 which helps foam produced by aeration (otherwise a cleanliness, safety or volatile chemical release problem) to flow into the overflow area 24. The retentate outlet 22 preferably also has sufficient capacity to release expected flows of retentate quickly to reduce the required free board of the tank 12.

Feed water enters the tank 12 through a first inlet 30 or a second inlet 32 as determined by feed valves 34. Once in the tank 12, feed water may be called tank water 36 which flows generally upwards or downwards through the membrane modules 10.

A filtration cycle has a permeation step followed by a deconcentration step and is repeated many times between more intensive maintenance or recovery cleaning procedures. The permeation step typically lasts for about 15 to 60 minutes, preferably 20 to 40 minutes and is carried out in the absence of aeration. Permeate flux is preferably between 10 and 60 $L/m^2/h$, more preferably between 20 and 40 $L/m^2/h$, wherein the surface area of hollow fibre membranes is based on the outside diameter of the membranes.

During permeation, feed water is added to the tank 12 from one of the inlets 30, 32 at substantially the rate at which permeate is withdrawn. Tank water 36 flows through the membrane modules 10 to generally replace permeate as it is withdrawn from the tank 12. Thus during permeation little if any tank water 36 flows out of the retentate outlet 22 and the level of the tank water 36 remains above the membranes. If the membrane module 10 acts to some extent like a media filter (as will some membrane modules 10 of tightly packed horizontally oriented hollow fibre membranes), feed

preferably enters the tank 12 through the second inlet 32. In this way, solids in some feed waters are preferentially deposited in the upper membrane module 10, closer to the retentate outlet 22 and where the upward velocity of the tank water 36 during a deconcentration step will be the greatest, as will be explained below. This set-up is also useful in retrofitting sand filters which are typically set up to receive feed from the top and to backwash from below. For other membrane modules 10, installations or feed waters, the first inlet 30 may be used during permeation.

The deconcentration step commences when permeation stops and lasts for about 20 to 90 seconds, preferably 30 to 60 seconds. During the deconcentration step, scouring bubbles are produced at the aerator 14 and rise through the membrane modules 10. In addition one or both of the steps of backwashing and feed flushing are performed. To flush with feed water, feed enters the tank 12 through the first inlet 30 creating an excess of tank water 36 which rises upwards through the membrane modules 10. The rate of flow of feed water during feed flushing is typically between 0.5 and 2, preferably between 0.7 and 1.5, times the rate of flow of feed water during permeation. With either backwashing or feed flushing, the level of the tank water 36 rises, tank water 36 flows upwards through the membrane modules 10 and tank water 36 containing solids (then called retentate) flows out of the retentate outlet 22 to deconcentrate the tank water 36.

In some cases, the upwards velocity of the tank water 36 may create forces on the membranes that exceed their strength, particularly if strong feed flushing and back washing are performed simultaneously. In these cases, the rate of flow of feed water or backwash liquid or both can be reduced to reduce the upward velocity of the tank water 36. Alternatively, the flow of feed water can be turned off during backwashing and any feed flushing done while there is no backwashing and vice versa. For example, a deconcentration step may involve backwashing preferably with aeration but without feed flushing for a first part of the deconcentration step and feed

flushing preferably with aeration but without backwashing for a second part of the deconcentration step. Further alternatively, deconcentration steps involving backwashing preferably with aeration but without feed flushing can be performed in some cycles and deconcentration steps involving feed flushing preferably with aeration but without backwashing can be used in other cycles. Other combinations of the above procedures might also be used.

Aeration is typically performed at the same time as the other steps to reduce the total time of the deconcentration step. Aeration may, however, begin several seconds (approximately the time required for a bubble to rise from the aerator 14 to the surface of the tank water 36) before backwashing or feed flushing. Such aeration in the absence of tank water 36 flow (because no space was left for downcomers) causes turbulence which help loosen some foulants and float some solids to near the top of the tank 12 before retentate starts flowing out the retentate outlet 20.

Aeration during the deconcentration step does not need to overcome suction to dislodge solids from the membranes and is provided at a superficial velocity (m^3/h of air at standard conditions per m^2 of module cross-sectional area) between 25 m/h and 75 m/h. For many if not most feed waters, particularly those feed waters having low turbidity and solids concentrations less than about 500 mg/L, additional aeration is not required. Nevertheless, a smaller amount of aeration may be provided with difficult feed water during permeation to disperse solids from dead zones in a membrane module 10 and homogenize the tank water 36. For this purpose, aeration is provided at a superficial velocity less than 25 m/h or intermittently at the higher rates described above.

During the deconcentration step, the feed water or backwashing liquid introduced into the tank 12 creates a flow of tank water 36 upwards through the modules 10. The tank water 36 flowing through the membrane

modules 10 helps remove solids loosened by the scouring bubbles from the membrane modules 10 and also directly acts on the surface of the membranes. The tank water 36 flows most rapidly near the top of the tank 12 which helps reduce preferential fouling of upper membranes when membrane modules 10 are stacked, for example to depths of 2 m or more. Some solids in the tank water 36 may have a settling velocity greater than the velocity of the upflow velocity and will settle. The volume of these solids is small and they may be removed from time to time by partially draining the tank 12 through a supplemental drain 38.

Based on a design permeate flux, the required flow of feed water during permeation can be calculated and delivered, typically by adjusting a feed pump or feed valve. The frequency and intensity of deconcentration events is then selected to achieve a desired loss in membrane permeability over time. If flux during permeation is kept below about 60 $L/m^2/h$, preferably less than 40 $L/m^2/h$, the inventors have found that surprising little fouling occurs and the periodic deconcentration events are usually sufficient. More surprisingly, the energy cost savings produced by operating at low flux and low aeration more than offsets the cost of filling the tank 12 with membrane modules 10. Despite the low flux (compared to a more typical flux of 50 to 100 $L/m^2/h$), high tank velocities (flux of permeate in m^3/h divided by tank horizontal cross sectional area in m^2) are achieved which compare favourably with sand filtration. Further, resulting recovery rates are generally adequate for single stage filtration and are typically adequate for the first stage of two stage filtration (wherein the retentate is re-filtered) even with aggressive deconcentration.

Figure 3 shows a plan view of a larger filtering reactor. A second tank 200 encloses several cassettes 220 each of which may contain a plurality of membrane modules. Open channels 202 are provided between adjacent cassettes 220 to receive tank water overflowing the cassettes 210 as described above. The channels 202 are sloped to drain towards a larger trough 204

which is in turn sloped to drain towards a second outlet 206. The second outlet 206 has an outlet box 208 to temporarily hold the discharged tank water before it flows into a drain pipe 210. As in the embodiment of figure 9, feed water enters the second tank 200 at a point below the cassettes 220, but several second inlets 212 are attached to an inlet header 214 to provide a distributed supply of feed.

It is to be understood that what has been described are preferred embodiments of the invention for example and without limitation to the combination of features necessary for carrying the invention into effect. The invention may be susceptible to certain changes and alternative embodiments without departing from the subject invention, the scope of which is defined in the following claims.

We claim:

1. A process of filtering water comprising the steps of,

(a) providing one or more modules of filtering membranes immersed in water in a tank open to the atmosphere;

(b) providing a retentate outlet from a portion of the tank above the one or more modules;

(c) permeating filtered water by (i) adding a selected volume of feed water to the tank and (ii) withdrawing substantially the selected volume of water through the one or more modules as permeate;

(d) periodically stopping permeation to perform a deconcentration step, the deconcentration step further comprising providing scouring bubbles from below the modules and at least one of (I) backwashing or (II) providing a flow of feed water into the tank from below the modules or both (I) and (II); and,

(e) flowing excess water containing retained solids out of the retentate outlet during the deconcentration step.

2. The process of claim 1 wherein the modules cover most of the horizontal cross sectional area of the tank.

3. The process of claim 1 wherein the modules cover more than 90% of the horizontal cross sectional area of the tank.

4. The process of claim 1 wherein the modules cover substantially all of the horizontal cross sectional area of the tank.

5. The process of claim 1 wherein aeration is commenced before backwashing.

6. The process of claim 1 wherein the filtering membranes are hollow fibres oriented horizontally.

7. The process of claim 4 wherein the filtering membranes are hollow fibres oriented horizontally.

8. A process of filtering water comprising,

repeating a filtration cycle having

(a) a permeation step wherein,

(i) feed water enters a tank; and,

(ii) a similar volume of permeate is withdrawn from the tank by suction on an inner surface of submerged filtering membranes; and,

(b) a deconcentration step wherein,

(iii) scouring bubbles rise through the modules;

(iv) the membranes are backwashed; and,

(v) water containing solids flows upwards through the modules and exits the tank.

9. The process of claim 8 wherein the filtering membranes are hollow fibres oriented horizontally.

10. A filtering reactor comprising,

(a) a tank open to the atmosphere;

(b) one or more modules of suction driven filtering membranes in the tank for withdrawing a filtered permeate;

(c) an inlet to add feed water to the tank from below the one or more modules;

(d) a retentate outlet to discharge water containing retained solids from the tank from above the one or more modules; and,

(e) an aerator below the one or more modules.

11. The reactor of claim 10 wherein the modules cover most of the horizontal cross sectional area of the tank.

12. The reactor of claim 10 wherein the modules cover more than 90% of the horizontal cross sectional area of the tank.

13. The reactor of claim 10 wherein the modules cover substantially all of the horizontal cross sectional area of the tank.

14. The reactor of claim 10 wherein the retentate outlet incorporates an overflow or weir.

15. The reactor of claim 10 wherein the filtering membranes are hollow fibres oriented horizontally.

16. The reactor of claim 13 wherein the filtering membranes are hollow fibres oriented horizontally.

17. The process of claim 8 wherein feed water is provided from above the modules during permeation.

18. The process of claim 9 wherein feed water is provided from above the modules during permeation.

19. A process of filtering water comprising,

repeating a filtration cycle having

(a) a permeation step wherein,

(i) feed water enters a tank; and,

(ii) a similar volume of permeate is withdrawn from the tank by suction on an inner surface of submerged filtering membranes; and,

(b) a deconcentration step wherein,

(iii) scouring bubbles rise through the modules;

(iv) feed water flows into the tank from below the modules; and,

(v) water containing solids flows upwards through the modules and exits the tank.

20. The process of claim 19 wherein the filtering membranes are hollow fibres oriented horizontally.

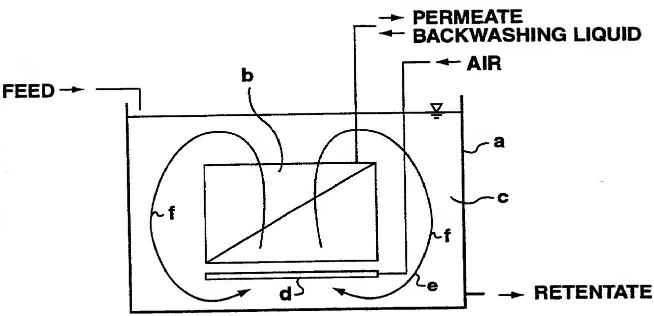
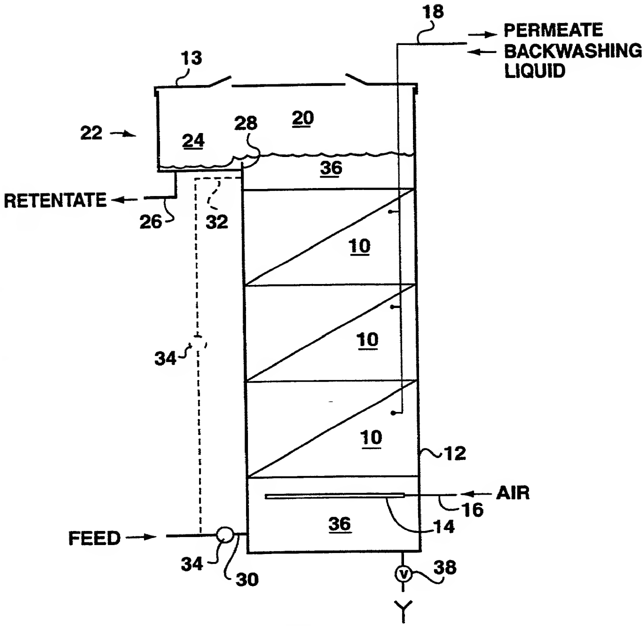


FIG.1 PRIOR ART


18
PERMEATE
BACKWASHING
LIQUID
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22
24
28
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36
RETENTATE
26
32
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34
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12
AIR
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38
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FIG. 2

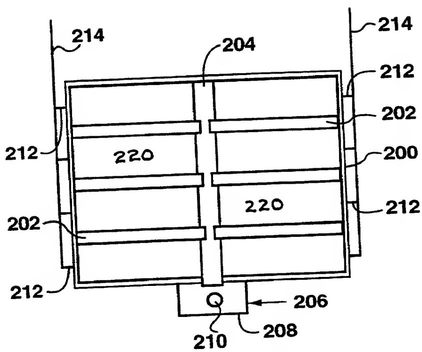

FIG. 3

09/889351
JC18 Rec'd PCT/PTO 17 JUL 2001

Initial Information Data Sheet

Inventor Information

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Citizenship Country::	Canada

PTO/SB/01A (10-00)
Approved for use through 10/31/2002. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

As the below named inventor(s), I/we declare that:

This declaration is directed to:

☐ The attached application, or

☒ Application No. PCT/CA00/01354, filed on November 15, 2000,

☐ as amended on ____ (if applicable);

I/we believe that I/we am/are the original and first inventor(s) of the subject matter which is claimed and for which a patent is sought;

I/ we have reviewed and understand the contents of the above-identified application, including the claims, as amended by any amendment specifically referred to above;

I/we acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me/us to be material to patentability as defined in 37 CFR 1.56, including material information which became available between the filing date of the prior application and the National or PCT International filing date of the continuation-in-part application, if applicable; and

All statements made herein of my/own knowledge are true, all statements made herein on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001, and may jeopardize the validity of the application or any patent issuing thereon.

FULL NAME OF INVENTOR(S)

1-00 Inventor one: Steven Pedersen
Signature: [signature] Citizen of: Canada

2-00 Inventor two: Pierre Cote
Signature: [signature] Citizen of: Canada

3-00 Inventor three: Arnold Janson
Signature: [signature] Citizen of: Canada

4-00 Inventor four: Nicholas Adams
Signature: [signature] Citizen of: Canada

☒ Additional inventors are being named on 1 additional form(s) attached hereto.

Burden Hour Statement: This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is used by the public to file (and the PTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This form is estimated to take 1 minute to complete. This time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Washington, DC 20231.

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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

As the below named inventor(s), I/we declare that:

This declaration is directed to:

☐ The attached application, or

☐ Application No. PCT/CA00/01354, filed on November 15, 2000,

☐ as amended on _____ (if applicable);

I/we believe that I/we am/are the original and first inventor(s) of the subject matter which is claimed and for which a patent is sought;

I/ we have reviewed and understand the contents of the above-identified application, including the claims, as amended by any amendment specifically referred to above;

I/we acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me/us to be material to patentability as defined in 37 CFR 1.56, including material information which became available between the filing date of the prior application and the National or PCT International filing date of the continuation-in-part application, if applicable; and

All statements made herein of my/own knowledge are true, all statements made herein on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001, and may jeopardize the validity of the application or any patent issuing thereon.

FULL NAME OF INVENTOR(S)

Inventor one: Jason Cadera

Signature: ______ Citizen of: Canada

Inventor two: ______

Signature: ______ Citizen of: ______

Inventor three: ______

Signature: ______ Citizen of: ______

Inventor four: ______

Signature: ______ Citizen of: ______

☐ Additional Inventors are being named on _____ additional form(s) attached hereto.

5-00

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